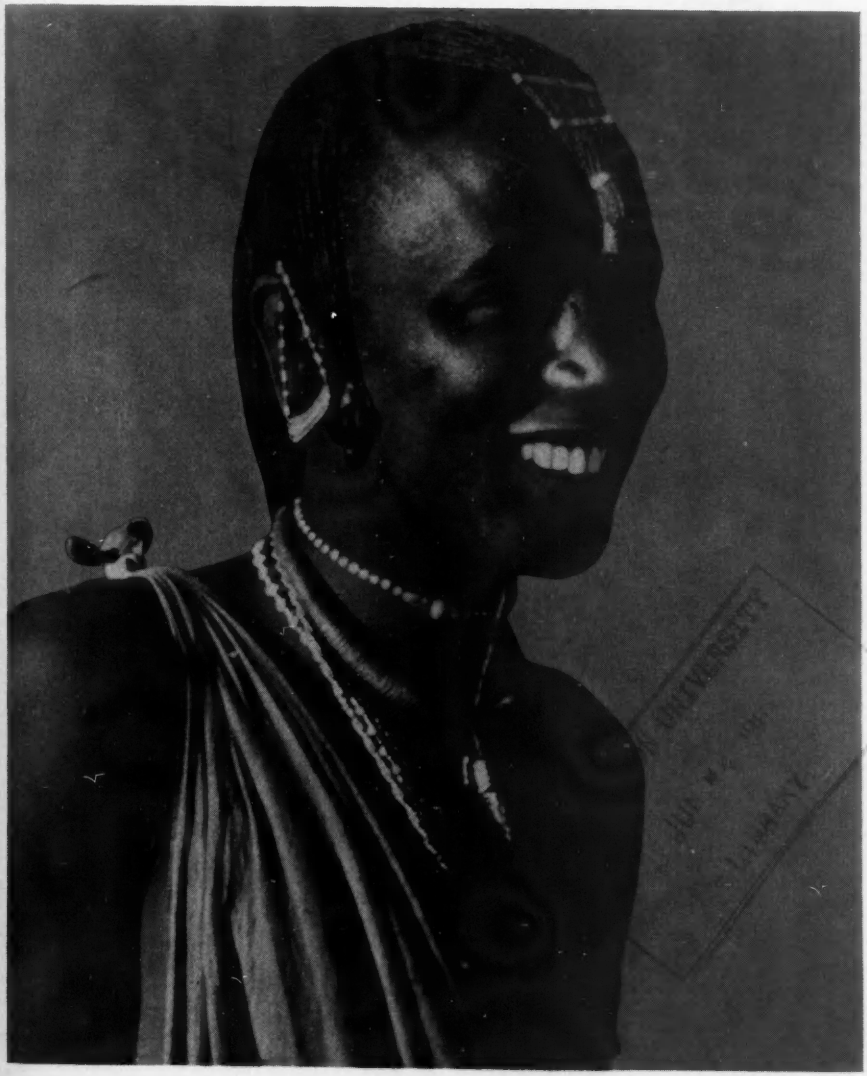
CARNEGIE
MAGAZINE



UNIVERSITY OF ILLINOIS LIBRARY

June 1961

The Economy of Egypt

Cat mummy in the collection of the Carnegie Museum

AMONG THE MANY CURIOSITIES to come out of Egypt are the mummies of cats, which have been found in large numbers particularly in the ruins of Bubastis.

Egypt's veneration of cats undoubtedly arose from their importance in defending the granaries from rats. Since the country's economy was primarily agricultural—being based on corn, barley and wheat—the cat stood between the people and starvation.

The simplicity of this economy—in which cats could play so important a role—was reflected in the primitive nature of early Egyptian banking. The priests stored the community's supply of precious metals and made the few necessary loans.

As more complex civilizations arose, the functions of banking gradually expanded and banks developed new services to meet new needs. Today's banks with their manifold services thus represent a direct response to the financial requirements of modern society.

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CAFETERIA OPEN FOR VISITORS TO THE BUILDING

Luncheon 11:00 A.M. to 2:00 P.M., weekdays
Snacks 2:00 to 4:00 P.M., weekdays

COVER

Young Masai *moran*, or warrior, of the famous tribe of lion-hunters who live in Kenya and Tanganyika. Armed with only a six-foot steel spear and shield, a *moran* does not hesitate to attack a lion. Their staple food is the blood of cattle mixed with milk, and this highly nutritious drink is considered by them to be responsible for their health, stamina, and courage. Photograph by Arthur C. Twomey.

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SUMMER CALENDAR

ADULT DRAWING AND PAINTING

Outdoor art classes for adults taught this summer by Roy Hilton and Raymond Simboli. Registration begins June 19. Tuition $12.00.

FREE NATURE MOVIES

Carnegie Lecture Hall at 2:00 P.M.

July 11 NATURE'S HALF ACRE; HUMAN ANIMAL
July 13 OLYMPIC ELK; YOUR FIVE SENSES
July 18 EVERGLADES PROWLERS; THE CAMEL
July 20 A WAY OF LIFE; GIFT OF THE AGES

DEPARTMENT OF FINE ARTS

Galleries on second and third floors closed in preparation for the 1961 PITTSBURGH INTERNATIONAL EXHIBITION OF CONTEMPORARY PAINTING AND SCULPTURE, which will open October 27.

Extensive rehabilitation of the three permanent collection galleries through generosity of The A. W. Mellon Educational and Charitable Trust.

Sculpture Court on the first floor being converted to the Section of Decorative Arts, courtesy of the Sarah Mellon Scaife Foundation. French, Flemish, and English tapestries displayed on first floor.

Drawings and water colors on the balcony.

Recent accessions in second-floor alcove.

Hall of Architecture, first floor, with full-size casts of many of the world's great architectural monuments from ancient times through the Renaissance; also reproductions of bronzes from Pompeii.

LIBRARY

First floor Lending Department with open stacks from which books may be borrowed without charge by residents of Allegheny County. . . . Gillespie Reading Room for browsing. . . . Public Affairs Room with latest material on world affairs . . . . Special Adult Services. . . . James Anderson Room for teen-agers. . . . Boys and Girls Room with children's books, also temporary exhibit of Sierra Leone arts and crafts.

Second floor Reference Department for information and research. . . . Music Division with books, scores, recordings. . . . Pennsylvania Division focused on western Pennsylvania, also local photographic collection. . . . Art Division with books, bound periodicals, pictures. . . . Periodical Room with current periodicals and newspapers, back issues on microfilm.

Third floor Technology Department for science and industry reference and research.

ART AND NATURE FOR CHILDREN

Nature Class two mornings weekly, July 6-28.

Sketching Class Tuesdays and Thursday, from June 27 through July 27.

Children grouped by ages. Advance registration for Sketching. Free. Telephone MA 1-7300.

STORY HOUR

Story hour (5 to 12 years) Saturdays, 2:15 P.M.

Story hour Wednesdays, 2:30 P.M., July-August.

MUSEUM

First floor Deadline for Wildlife, conservation exhibit sponsored by Pennsylvania Game Commission: game fish specimens, family groups of small mammals, mountain waterfall. . . . Marine Hall with big game and coral reef fishes, statistics on the sea . . . . Dinosaur Hall containing world-famous Jurassic collection with *Diplodocus carnegiei, Apatosaurus louisae,* and *Tyrannosaurus Rex.* . . . Fossil Mammal Hall with Cenozoic specimens and Panoroll, "The Age of Mammals". . . . Insect and Invertebrate Hall: enlarged glass models, habitat groups, insect family tree, invertebrate specimens. . . . Bird and Reptile Hall: habitat groups, Bird of Paradise, snakes of Pennsylvania.

Second floor Mammal Hall with habitat groups of North American and African mammals, models of North American big game, specimens of some forty Pennsylvania mammals. . . . Plant Hall with ecological exhibits, models of plant fibers, local fungi, poisonous plants. . . . We Humans, European Siege Coins, Boy Scout Postage Stamps, minerals.

Third floor American Indian Hall with Spearpoint and Potsherd (local prehistoric Indians), life-size figures of Sioux, Hopi, Zuni, Navajo, Yuma, Chippewa. . . . Ancient Near East Hall: Egyptian burial boat, predynastic burial, mummies of people, animals, birds, also jewelry, tools, textiles. . . . Ancient Mesopotamia: objects from South Arabia, model of Khirbet Qumran, where Dead Sea Scrolls were written. . . . vehicle models in Transportation Hall. . . . Hobby Hall: Peace Stamps, Roof over Your Head, German Bisque Dolls, Presidents and First Ladies, Evolution of Lighting Fixtures, Wooden Ships and Iron Men.

SUNDAY ORGAN RECITALS

Marshall Bidwell presents a recital on the great organ of Music Hall each Sunday at 3:00 P.M., sponsored by the Arbuckle-Jamison Foundation, continuing through June, resuming September 24. Dr. Bidwell will feature wedding music on June 4.

EAST AFRICAN EXPEDITION

ARTHUR C. TWOMEY

THE cool freshness of the early morning brings an acceleration, an air of expectancy, that only Africa can produce. The glow of the low-rising sun over the eastern escarpment of the Great Rift Valley at Lake Naivasha is caught and reflected by the soft, greenish-yellow bark of the fever trees.

SAFARI ON ESCARPMENT OVERLOOKING RIFT VALLEY

All through these yellow acacias and the dense thorn thickets, zebras can be seen. They are everywhere — ten, twenty, fifty, feeding, fighting, resting; the great stallions, the mares with young; their black and white hides seem to dance in the sun, then become shimmering shadows in the deep shade.

Impala appear in large, nervous groups, the bucks with their widespread horns of incredible grace constantly on the alert. At the slightest sign of danger, these graceful creatures take off in great, bounding, twenty-foot leaps that carry them to heights of ten feet as they dash for safety.

Herds of Tommies (Thomson's gazelle) feed in the open glens, their tails working like windshield wipers. Grant's gazelles prance by with heads held high, horns sweeping back over their shoulders.

It seems unreal to be seeing so many animals all in one area, and yet, for every one seen today, ten years ago there were a hundred.

The many cinder cones of the Rift remind one of ages long ago when this area was undergoing violent volcanic action, and the scene is no less spectacular today.

The air is filled with songs of birds: three African crowned cranes call loudly as they glide overhead, gracefully sweeping low to a running stop, their golden crests glistening in the morning light. A pair of secretary birds with their quill-like crests quarter a large meadow on stiltlike legs in quest of snakes, rodents, and small birds. Crowned lapwings chorus their musical cries, great African fish eagles can be heard calling from the lake shore, and lilac-breasted rollers flash their turquoise wings in pursuit of flying insects. A hoopoo with helmeted crest looks for ants in the grass, and superb starlings reflect bright emerald and steely blue in the sun. A male red-collared widow bird with a foot-long, black satin tail hovers above a drab female in the tall grass.

The most breath-taking experience of all is to see a flash of shimmering gold as the golden-winged sunbird darts about in the thorn scrub; then, as if this were not enough, the most startling of all the sunbirds, the

scarlet-chested sunbird, alights on a small thorn tree within ten feet, showing off its metallic-green crown and crimson chest against the soft velvety black of the rest of its plumage.

A troupe of baboon breaks the air with a sudden shriek of barks, cries, and snarls. Near the lake shore a jackal trots along but quickly vanishes. Lily-trotters (African jacanas) with four-inch-long toes walk on the lily pads in search of snails and insects. A large female hippopotamus suddenly grunts her complaint from the edge of the tall-plumed papyrus swamp, her cavernous mouth opened menacingly as she exposes giant teeth. She has a young one hiding in the papyrus growth.

This is Africa as it suddenly emerged for us that first morning on the shores of Lake Naivasha. It was the beginning of our expedition, the beginning of an ever changing scene—our first glimpse of this earth's last great animal show.

It was through the generosity of Dr. Matthew T. Mellon and the Matthew T. Mellon Foundation that this extensive expedition to East Africa was made possible.

The section of ornithology of Carnegie Museum has been interested in Africa for a good many years, but prior collections were mainly from the Cameroons, Rhodesia, and Angola; none were from the east central part of the continent. With the social and political upheaval now taking place in Africa, collecting in the next decade might well be impossible, and this was a factor in our planning.

The objects of the expedition were:

1. To collect in areas of Kenya, Uganda, and Tanganyika that within the next ten years will be destroyed as a natural environment by the native population explosion.

2. To work in some of the collecting localities made famous by earlier expeditions that are now type localities for many races of birds and mammals. ("Type locality" to a scientist means the location from which came the specimen first scientifically described and classified.)

3. To reach a few of the extensive areas still untouched by biological explorations.

After many months of preparation we found ourselves in Nairobi making final arrangements for our safari expedition. Our main party was made up of Jay Mellon, son of Dr. Mellon, Mrs. Twomey and myself, from the United States; and from Kenya, Dr. John Williams, ornithologist of the Cornyndon Museum in Nairobi, William Ryan and Tony Archer, both professional hunters. Ker & Downey Safaris Ltd., of Nairobi, supplied our three five-ton lorries, three Land Rovers, plus the necessary camping equipment to sustain our scientific party and forty-two Africans in the field. The Africans were camp boys, trackers, gunbearers, mechanics, drivers, cooks, skinners, and handy boys. The details involved in getting a party of this size under way are endless.

KENYA

It was June 1 before we were off, stopping briefly at the eastern edge of the Great Rift Valley before beginning our descent to the Valley floor and then on to our first camp at Lake Naivasha.

Leaving Lake Naivasha we moved to Lake Elmenteita, and from there proceeded to Lake Nakuru, the most saline of the Rift Valley lakes.

The time to see Lake Nakuru is early morning, just as the sun comes over the Rift escarpment. The broad, deep blue lake is bordered completely with a wide, pale pink and white ribbon that, coming nearer, we see is made up of flamingos—a few greater flamingos among the lesser. We estimated

there were two and a half million flamingos in this one Lake. Truly, this is one of the greatest bird sights and experiences in the world. As we walked down to the shore, the birds merely moved ahead, leaving a wide circle a hundred and fifty yards around us. The noise was incredible but not harsh; it filled the air with a murmuring that rose and fell in volume and yet seemed to hang overhead.

The flamingo is found in many parts of the world, but surprisingly little is known of its nesting habits. These birds are always at Lake Nakuru, their numbers sometimes reaching three to four million, although they are known to have nested there only once in the past fifty years. It is known that the lesser flamingo nests in the Persian Gulf, and possibly some of these birds are from that area. This is quite a logical assumption, since the Great Rift Valley extends from Palestine to the mouth of the Zambezi, and flamingos are found through the Rift Valley lakes. Food is the reason for their great concentration at Lake Nakuru. Apparently the extreme salinity of the water affords an excellent environment for small crustacea, which multiply in such numbers that these macroscopic forms can supply sufficient food the year around for this enormous concentration of birds.

The day came when we left the Great Rift Valley and climbed out over the eastern escarpment on a good Tarmac road that wound its way through the White Highlands, an area where most of the European farmers are located, in Kenya. Here for the first time we had the opportunity to see country that was hewn from the densest of jungles and high altitude brush. In many places the jungle was still untouched; in other areas there were farms, ranches, and plantations of the Highland farmers. If it were not for the jungles, the graceful umbrella acacias, and the great flocks of African crowned cranes, one would think he were in the farming areas of the mountainous parts of Oregon and Idaho.

It was here that we had the good fortune to see Rothschild giraffe, the five-horned species, now reduced to about a hundred and fifty in number. If

it had not been for a few conservation-minded White Highland farmers, this rare mammal would have been exterminated long ago. We alighted from the Land Rover, determined to photograph these rare giraffe. The big bulls are very large and have a much higher hump on the shoulder than the more common Masai species. We counted fifty-eight altogether in full view. They proved fairly easy to approach, although they kept some hundred and fifty yards ahead of us. Jane, John, and I started after them. John made a wide circle to try to drive them toward a group of thorn trees where we were waiting with our cameras.

I noticed a young giraffe and female suddenly dart away from an open field of tall grass, while the big bull stood stamping his foot and looking very intently at the grassy area seventy-five yards away. At that moment John could be seen making a rapid retreat. As he approached, he casually informed us he had just seen a couple of lions in the grass, and that it would be a good idea to get back to the Land Rover. I must say one experiences a very odd feeling when he suddenly realizes for the first time that he is afoot, without a rifle, within one hundred yards of two or possibly more lions. The three of us were soon back on the road.

That night as we sat around the dinner table we talked of many things, and particularly about the White Highland farmers. As we talked, Bill Ryan, a man born and reared in Africa, gave us some idea of the many-sided problems that face East Africa today. He had been reared on a farm in South Africa and had moved to Kenya with his family just after the first World War. Tony Archer, our other professional hunter, was just twenty-five, but he, also, had fought the Mau Mau and had hunted them in the dense jungles and bamboo forests of the Aberdares. His father owns a coffee plantation near Nairobi. It was with keen interest that we listened to these two men and their stories of Africa and its problems, which are very close to them since it is their home and country.

The British are working hard to find a formula that will protect the rights of all peoples in Kenya, Tanganyika, and Uganda. In the past they have done and still are doing much to further the education of the natives, to give them the advantages of modern medicine, and finally to help them realize a better way of life. The British have gone a long way toward stopping intertribal warfare, infant mortality; toward better agricultural methods, and control of malaria, Bilharzia, the tsetse fly, and leprosy.

All these controls have led to a sudden upsurge in the native population, until today the black African finds his lands too small and needs larger areas for expansion.

CHICK APPEARS UNDER BROODING MALE OSTRICH

TURKANA TRIBESMAN WITH OSTRICH PLUMES IN CLAY HAIR-DO, IVORY CHIN PLUG, MANY BEADS

The Kukuyus of Kenya are openly eyeing the rich White Highlands as their own lands. The Europeans and Indians (Asians) are finding themselves minority groups, greatly outnumbered. The white and Asian races want community equality that would give equal representation in government to each racial group. Many whites and Asians have been born in Africa and look upon the African country as their true homeland. They do not want to become a political minority for fear they would be engulfed by the native Africans. The original Africans, on the other hand, wish for numerical representation in government, and the cry, "Africa for the Africans," is growing in strength.

The political problems of East Africa are very complicated, and it will probably take a very long time to find a fair solution. Nevertheless, independence is already a partial reality for Tanganyika, and is very close for Uganda. Kenya has its independence movements, but British interests will probably delay self-rule here for some time. We must conclude that the beginning of modern civilization in most of East Africa is as yet quite humble, but with the promise of a great future.

We had considerable trouble securing permission from the British government to allow our safari to proceed to the western shores of Lake Rudolf, mainly because of the danger of primitive raiders who come down to Lake Rudolf from the Sudan and Ethiopia. These primitives still enjoy killing strangers and are not too particular whom they attack. Eventually permission was granted, and we entered the northern frontiers.

This entire area is hot, very mountainous, eroded, and covered with a vast scrub desert cut up by great luggars (dry river beds) that during the rains become raging rivers. Here termite mounds rise to heights of thirty feet. An occasional band of Grant's gazelles can be seen looking like shimmering goats in the haze of the desert sun.

Birds are numerous along the luggars: The white-bellied go-away-birds with their tall crests and black-and-white tails were always very noisy whenever we tried to move quietly through the thorn bush. Ring-necked doves were everywhere, often appearing in large flocks particularly around the open water holes. Along the stony, sandy desert, Heuglin's coursers were often seen running ahead of us or resting quietly in the shade of a thorn tree during the intense heat of the day. Mouse birds with their long, spinelike tails were seen in large flocks of approximately ten to fifty, running along the branches of the thorn bushes looking

much like mice. The most beautiful of the birds of prey was the swallow-tailed kite we observed at Lodwar on the approaches to Lake Rudolf. This small kite is gray on the upper part of its body and white underneath, with long, slender, pointed wings and a deeply forked tail. In flight it looks more like a tern as it hovers over the desert in search of grasshoppers.

In Lodwar we met the District Commissioner at his office overlooking a courtyard that was surrounded by a low, mud fence thick enough for defense in event of an attack on this British outpost. We were received with the greatest courtesy and told we could proceed to Ferguson's Gulf on Lake Rudolf, since our party was self-sufficient.

It was here that we saw Mau Mau terrorists behind barbed-wire enclosures. These were the men Bill and Tony had fought, men who had taken such frightful oaths to kill all white men by the most brutal means imaginable. Yet they looked mild enough as they squatted in the sunshine, serving out their sentences well away from the more settled parts of Kenya. It was here, too, that the leader and organizer of the Mau Mau, Jumo Kenyetta, was also held a prisoner. We, of course, did not see him, nor were we allowed to take pictures within two miles of Lodwar.

Lake Rudolf is a vast lake in an endless desert. On our first view, its surface was covered with whitecaps and its shores were crowded with birds. Birds were everywhere: pelicans, spur-winged plovers, egrets, yellow-billed storks, Egyptian geese, Goliath herons, cormorants, spoonbills, black-winged stilts. This was truly a tremendous concentration of bird life.

No sooner had our trucks arrived than we were surrounded by black men who were lithe and slender. Their hair was done up in a blue clay and adorned with ostrich plumes or covered with the white breast feathers of the pelicans. They wore, in addition, a mass of red, blue, and yellow beads around their necks, and nothing else. The women were shy but soon edged in closer. Some wore v-shaped aprons sewn with bits of ostrich eggshells, others wore skins of animals around their waists and coils of wire around their necks and arms. All were covered with scars around their shoulders, some scars for beauty and others as a result of blood-letting.

These were the Turkana natives of Lake Rudolf, known as Lake Turkanas, a Hamitic people, the real primitives of Africa—primitive not in the sense that they are cruel but that they still cling to and are loyal to ancient tribal beliefs. These people do not drift about, but remain at the Lake. The women, as usual, were working—carrying water and wood, caring for the children, always working; while the men sat around in small groups under the acacia trees talking, or sleeping with their heads propped on sleeping stools to protect their unusual clay hair-dos. This was their entire world. The fish of the lake, called telopia, with catfish and Nile perch supply their needs. They have no boats but use the trunks of the Dom palms lashed together to form crude rafts that serve them well.

We talked to their head man about supplying our camp with fresh fish. The next day a hundred Turkana men appeared along the shore, each with a semicircular basket of wood and fiber about five feet in circumference, open at the bottom. With this they

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With African countries in the forefront of international news, last summer's Carnegie Museum expedition headed by Dr. Twomey assumes special interest. Accordingly, CARNEGIE MAGAZINE lays aside its policy of short articles for his description of wildlife in Kenya, Uganda, and Tanganyika.

Dr. Twomey is director of the Division of Education and curator of birds at Carnegie Institute.

AFRICAN ELEPHANT STILL RELATIVELY NUMEROUS. OLD BULL MAY WEIGH SIX TONS.

waded out into the shallow water, the men forming a long line that gradually moved back toward the shore, driving the fish into an ever narrowing area. The baskets were plunged downward at random to the mud at the bottom, and when the fish was caught, it could be felt lunging about inside the wickerwork. It was then caught up and strung on a long fiber stringer. The men soon had sufficient fish, which they quickly scaled and cleaned with a sharp-edged gill bone from a Nile perch. Telopia proved to be a very fine fish for the table.

For their own families, Turkana women clean and dry the fish in the sun, thus providing themselves with enough protein to survive in this harsh land where there is little else for them and little but weeds along the lake for their herds of cattle, goats, and sheep.

The District Commissioner at Lodwar had given us permission to use an old rowboat at the Gulf. Going out in this ancient craft accompanied by two primitive Turkana warriors as oarsmen, we were followed by a ring of huge lake crocodiles that kept abreast of us wherever we went—not too comfortable an experience. We were told that the Rudolf crocs are well filled with fish, but I noticed a couple of Turkana fishermen hobbling around on one leg—the result of hungry crocs.

The Lake was full of huge Nile perch, some of which I am sure would weigh three hundred pounds, although the largest we landed on rod and reel was a fifty-pounder, a mere baby. Tiger fish with a mouth full of long, needle-sharp teeth were very sporting to catch, as they put up an active fight on the surface of the water in much the same way as a large trout.

As night came to the Lake, small groups of skimmers glided low over the water, batlike in their movements as they cut the sur-

face with razor-sharp, elongated, lower mandibles. Night was always cool and velvety, with a sky full of stars. It was nice to sit around an open fire after dinner and talk of the day's events.

The peace of the night was always shattered by a great, hot wind that would suddenly spring up by one o'clock in the morning. A warm, dry wind caused by a sudden thermal change in the air would churn the Lake into mountainous waves. It always turned the camp into flapping canvas and torn-up guy ropes that called for several excursions into the night armed with a wooden mallet. The winds would keep up their fury, to die down gradually only by ten or eleven the next morning. Soon the Lake was a shimmering sheet of still water, but by midnight it again would be thrown into a turmoil.

This was a nightly occurrence so, in spite of the richness of the collecting in this locality, we welcomed the day we left the shores of Lake Rudolf.

UGANDA

On our way into Uganda, the road passed over the large Owen hydroelectric dam at Jinja. It was here in 1862 that John Hanning Speke reached Ripon Falls, the source of the mighty Nile as it spills out of Lake Victoria. Today this area is completely covered by waters backed up behind Owen Dam.

Owen Dam today supplies hydroelectric power for the industries of Uganda and western Kenya and will be a source of power for future developments in this land.

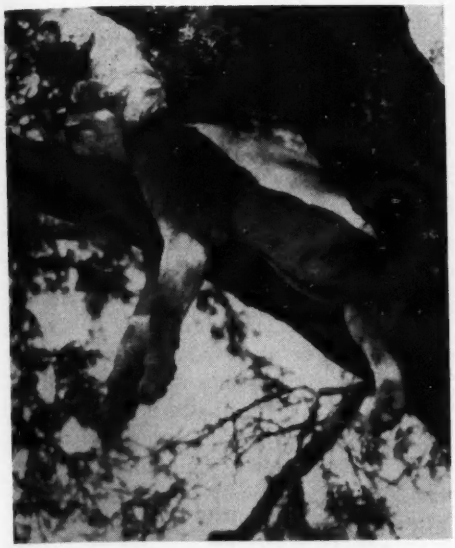
A hundred miles down the Victoria Nile one meets Murchison Falls, noted not so much for its height as for the fact that here the entire Nile is squeezed between two great cliffs only twenty feet apart, then goes hurtling down into a vast whirlpool as it swirls toward the Mediterranean. A mile below the Falls the water spreads into the smooth, yet swiftly moving, Nile. The dry, hot, thorn desert forms an abrupt river bank. In some places the bank becomes a dense, tropical forest, and quite often it forms a mud bar covered with high papyrus reeds that spread into large swamps.

Great herds of hippopotami sleep in the mud, partly submerged in the water. Egyptian geese, spur-winged plover, yellow-billed storks, yellow-billed egrets, solitary saddle-billed storks, and Goliath herons feed close to the hippos. On ground that is not so wet a group of six Uganda kob feed quietly, as a shaggy male waterbuck grazes nearby. Against the distant grassy hillside a large herd of Cape buffalo browse while coming down along the dark green edge of the riverine forest.

A herd of nearly a hundred elephant moves toward the river bank. Great old bulls come, and females with calves, and when the young bulls are within fifty yards of the water, they suddenly race for the river bank and plunge in. Sitting on their haunches, they splash water in every direction with their trunks like happy children in a bath.

The waters, filled with Nile crocodiles

BEAUTIFUL AND DANGEROUS AFRICAN LEOPARD



LIONESS UP A TREE FOR COOL SIESTA

often twenty feet in length, are extremely dangerous. The river banks are piled with crocodiles basking in the sun, their open jaws displaying rows of giant teeth.

The scene was constantly changing, and one could watch it for hours—the old, the primeval, Africa.

Our expedition moved into the heart of tropical Africa in Uganda, a country still largely unknown to the outside world. Uganda occupies a lofty plateau astride the equator and is a land of endless variety, of quick and vivid contrasts. Here one finds richly fertile valleys and harsh, forbidding scrub; turbulent waterfalls and immense stretches of sluggish swamps; snow-crested mountains and forests so dense that even the sun cannot penetrate them. To the west, the mysterious Mountains of the Moon soar 16,794 feet with their white, gleaming glaciers; to the east can be seen Mount Elgon, a burned-out crater five miles across; and to the south appears that great inland sea, Lake Victoria, with Owen Dam that we had just passed over. Between is country green as emeralds, threaded with lakes and rivers, the haunt of elephant and buffalo, Uganda kob, eland, lion, and leopard. Over six million Africans of numerous tribes and various languages are crowded into this land. The vast majority of the people are peasant farmers living a bare existence. The banana, plantain, and maize form their staple diet; yet cotton, coffee, tea, sugar, tobacco, and oilseeds have made Uganda prosperous.

Our objective was to reach the last great African forests in the Kigezi district, Fort Portal, the Impenetrable Forest, and the western slopes of the Ruwenzori Mountains, known as the Mountains of the Moon.

From Fort Portal we proceeded on a very winding, high mountain road that hugged the precipitous slopes. Perched here and there on high mountain shoulders, or along the edges of the deep valleys, were the grass-thatched huts of the local native farmers. On the steep mountainsides, a sea of ten-foot elephant grass was now being put to the torch by the farmers. This was the dry season, and we had barely left Kampala when we met the smoke. The sky and all the land now were filled with a blue and gray haze that blotted out the sun. It covered the great snowy crests of the towering Ruwenzori Mountains. We had been in sight of these Mountains of the Moon for days, but although we spent the next three weeks in these mountains, there was never a moment that we had a view other than the lower edge of the cloud forest at eight thousand feet. The entire country seemed to be on fire.

Of course, fire has been a natural occurrence in Africa for eons, breaking into the forests and plateaus and changing the secondary successional forests into grasslands and savannas. But fire no longer is just a natural event; it is man-made and far too

frequent. Instead of being a secondary hazard, it is now destroying the primary forest cover. The natives are deliberately setting these fires in their feverish desire to claim a plot of land, ranging from two to ten acres, and turn it into a shamba or small farm of bananas, maize, coffee, or yams. With this they eke out a bare existence, but it does not allow them a surplus of supplies in case of economic crisis. The fallacy of this destructive agriculture is evident, as it serves only to induce rapid erosion with resultant loss of good soil and valuable lumber resources.

As we reached the northern shoulder of the Ruwenzoris, the great Ituri forest spread out below us, disappearing into the vast Congo basin with its Semliki River, a snake-like ribbon of silver curling in a deep green sea. It was in this forest, not far from a place called Bundibugyo, that we set up our camp. John Williams had been here fifteen years before, when the forest extended in a solid band southward over the entire mountainside, but we soon found that the forest was merely a remnant of what it had been. There is just a seven-mile strip of forest reserve left to give us some idea of the original rain forest. Great trees shoot up to heights of two hundred feet, and beneath them are dense mats of vines, creepers, rope-like lianas, ferns, and palms.

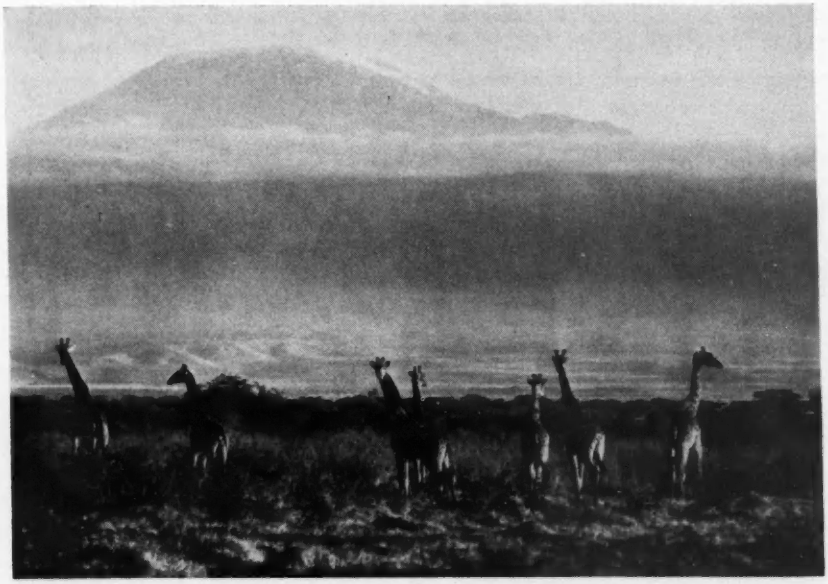
Troops of chattering Colabus monkeys and the occasional howl of a chimpanzee could be heard. Silver-cheeked hornbills with their tremendous bill casques flew through the tops of the high trees, and palm-nut vultures called harshly from the group of oil palms near camp. (The palm nut is one of this vulture's foods.) Paradise flycatchers with their long, russet tail-feathers and high, black crowns were frequently seen. This was the home of the rare potamogale (a large water shrew) and the extremely rare, and strange, elephant shrew.

Here the dense vegetation made an excellent area for the use of our mist nets. They are very fine, black nylon nets that look much like a fish net a hundred feet long. The nets were set up in narrow avenues cut through the dense undergrowth. Birds passing through the undergrowth, unable to see the nets, would become entangled in them. By this method we were able to capture many forest birds we had never seen, and, in some cases, had never suspected of being in the area. This method proved a most satisfactory way to catch the birds, since the specimens were uninjured and could either be kept or turned loose.

Once in a while we would find dead birds in the nets, and upon close examination we discovered they had been killed by snakes, probably by the black mamba, green mamba, or black-lipped cobra, all of which are extremely poisonous. The mambas are particularly noted for their aggressiveness and lethal poison. Whenever we found dead birds in the nets we were always a little more cautious as we walked through the forest. The snake we held in the greatest fear was the gaboon viper, one of the world's most poisonous snakes. Fortunately they are not aggressive and are seldom seen because the pattern of their bodies almost completely camouflages them in the dark shadows of the jungle floor.

For nearly a month we continued our collecting throughout the dwindling forests of Uganda, securing some of the rarest birds and mammals of Africa before moving into Tanganyika, where we were to spend the last few weeks of our African expedition.

It was while we were still near the Narok area of Kenya, close to the Mara River, that our main expedition party enjoyed a brief, five-day visit from Dr. and Mrs. Mellon, who were on their own photographic ex-



HERD OF GIRAFFE BROWSING PEACEFULLY IN THE SHADOW OF MT. KILIMANJARO

pedition. Our combined camp, under the great, yellow-barked acacias, was an ideal setting for the group. Elephant had been in the area only a few weeks before, as evidenced by the large number of acacia trees that had been pushed over and stripped of branches. It was a most delightful experience to have the Mellons in camp with us, to be able to show them our collections, and to have them accompany us on field excursions.

In the evening, after dinner, we sat under the stars of the African night around an open campfire. Hyenas were numerous, and just beyond the camp light could be heard their hysterical laughter. Jackals were chattering, and from off in the distance came the deep rumbling cough of a lion. It was as if Africa were putting on a show for our visitors.

One night, when the camp slept, I awoke to a soft padding as of many feet near our tents, then suddenly a great racing noise as if a herd of horses were galloping away. This sound occurred several times, but it proved just a group of hyenas that had sneaked into camp, then became frightened and, throwing all caution to the winds, had galloped off in a mad scramble.

TANGANYIKA

After Dr. and Mrs. Mellon left, we moved our camp southward to Loliondo in Tanganyika, one of the finest big-game areas in all East Africa. The luggars are strewn with dense riverine forests; there are rolling hills, broad grassy plains, and thorn savannas.

One of the most beautiful species of the touraco, Hartlaub's touraco, was abundant here, flashing crimson and blue wings, emerald-green backs and tails as they half flew, half glided to the nearest brush-covered donga. Birds were unbelievably abundant —tawny eagles, Batleur eagles, helmeted

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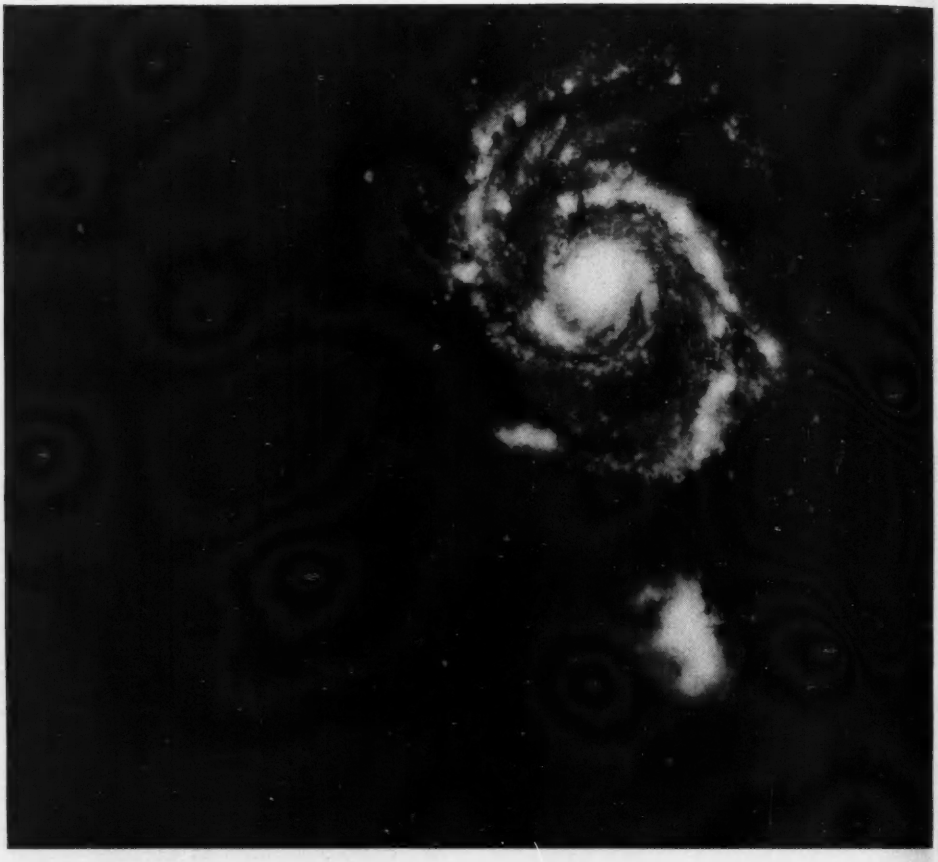

How cold is up? We know that outer space can never be colder than minus 459.72° Fahrenheit—that's absolute zero, the point at which all molecular motion ceases. We don't know what coldness like this will do to materials, but we're finding out. Scientists are using a heat exchanger to produce temperature as low as minus 443° Fahrenheit. They test materials in this extreme cold and see how they perform. Out of such testing have already come special grades of USS steels that retain much of their strength and toughness at −50° or below; steels like USS "T-1" Constructional Alloy Steel, TRI-TEN High Strength Steel, and our new 9% Nickel Steel for Cryogenics applications. And the heat exchanger to produce the −443° Fahrenheit is Stainless Steel! No other material could do the job as well. Look around. You'll see steel in a lot of places—getting ready for the future. USS, "T-1" and TRI-TEN are registered trademarks

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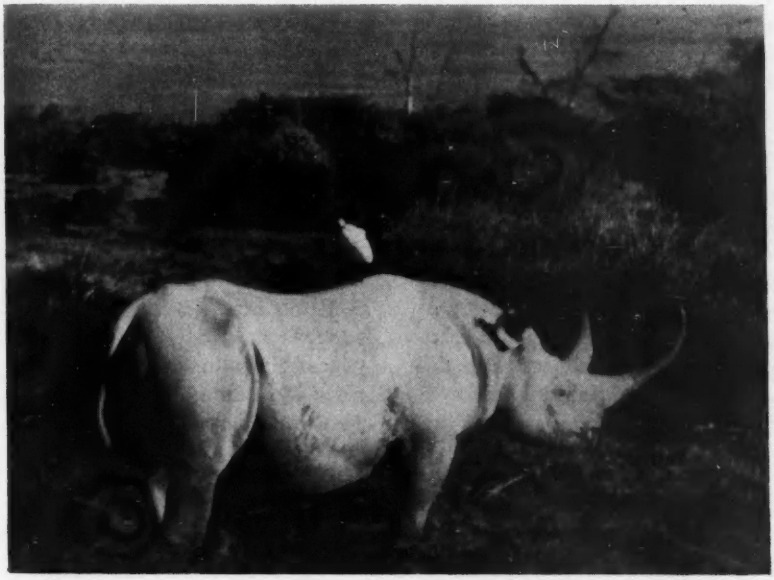
shrikes, buffalo weavers, sunbirds: all were here in this paradise.

Fresh lion and leopard tracks were seen near the water holes of the luggars where rhinoceros came to drink at night. Tommies, Kongoni, Grant's gazelle, zebra, and an occasional eland grazed on the plains.

In the scattered thorn bush a honey guide —gray, about the size of a blackbird—chattered incessantly with expectancy in its call and actions, apparently wanting us to follow it. The bird would fly ahead fifty yards or so, then wait to see if it were being followed. The moment we caught up to it, off it would fly again. This honey guide led us to a rocky cliff where, high in a deep crevice, there was undoubtedly a bees' nest. These unusual birds will guide a man to a bees' nest and chatter excitedly until they are given some of the cone and bee larvae as reward for their efforts. The native Africans always say you must give the honey guide its share, or the next time it will guide a person to a sleeping rhino, or maybe a deadly green mamba.

In the early morning, just as the sun was breaking over the hills, herds of Cape buffalo could be seen grazing on high, grassy meadows. We saw as many as a hundred in one herd, but usually there were three, five, or fifteen grazing quietly. In the scattered thorn savannas of the mountain valleys, giraffe could be seen browsing on the tops of the acacias, and from their high vantage point they always kept a sharp lookout for any sign of danger. It seemed that all other creatures watched and were guided by the giraffe, for once the giraffe started to move away, so did the zebra, waterbuck, hartebeeste, and Tommies.

While hunting through this area we were frequently surprised at the sudden appearance out of the thorn thicket of two tall, extremely slender men, their faces and bodies



RHINOCEROS WITH EGRET LOOKS PEACEFUL BUT HAS VILE TEMPERAMENT

covered with the stain of ocher clay, their hair braided and heavily covered with red ocher. Each man wore only an ocher-stained cloth over one shoulder, and around his waist a belt with a two-foot double-blade sword. In his hand each carried a six-foot spear with four-foot blade. These men were the *moran*, the young warriors of the Masai. We were soon to learn a great deal about these people, Nilo-Hamitic in origin, with a Caucasoid cast of feature like the Ethiopians. These two copper-skinned warriors were members of the famed lion hunters, who unhesitatingly affront dangerous quarry armed solely with a spear and shield of buffalo hide.

A courageous tribe, the Masai love danger, excitement, and fighting to such an extent that the authorities have had to prohibit the carrying of shields. The sight of shields, alone, is enough to bring out their savage instincts. As for the spear, the Masai would no sooner be without it than a European would consent to be separated from his billfold. These long spears are their constant companions. I have never met a Masai *moran* without one. It is understandable, however, that a spear is vitally necessary to a man who travels days and nights on end through country infested with dangerous game.

The Masai have not taken to civilization. They do not want to work. They prefer to live in a state of savagery in the heart of their cattle country, where the lions roam and where they may travel at will over the rolling savannas. This celebrated tribe is comparatively few in number — forty-five thousand in Tanganyika and sixty thousand in Kenya just across the border. Here they roam over about forty thousand square miles of the Masai steppes.

They worship their cattle. To them cattle represent wealth, and today the Masai have over 1,500,000 head of cattle and at least another 1,000,000 head of sheep and goats. The problem here is that the Masai will not kill their cattle for food. They have the custom of incising their cattle in the neck, then catching the warm blood that spurts from the wound. They mix this blood with milk to form a reddish beverage. This highly vitaminized drink, according to the Masai, is their source of health, strength, and endurance. They will, of course, eat meat on occasion, and ground-up millet.

It is because the Masai do not touch game that the greatest concentration of game mammals is found throughout the Masai steppes. With steady increase of the Masai herds and subsequent competition for water and grass—also because herds are often kept around a water hole even during the worst of the dry season—the volcanic soil soon breaks down to the consistency of talcum powder. Wind erosion soon destroys the area and helps to accelerate the encroachment of the desert. Tension is building up here, and something will have to be done soon if the game is to continue, as well as the Masai cattle, which are ever increasing in number.

There is nothing quite like the sudden falling of an African night. It comes dramatically, often with a flaming sunset or dark, heavy clouds, but always it comes quickly, accompanied by the loud whistles and calls of the francolins. The sun would scarcely set at our Loliondo camp before a pair of big male lions would start their deep roars and rumbling coughs. The roars were sometimes heard in the distance as they circled camp, but eventually the ground would seem to shake with their roaring as they moved in close to camp. The fires always seemed to burn a little brighter at this time, but none of the boys would admit they had put more wood on the flames. This

Photos by Arthur C. Twomey

CLASS IN THE SHADE OF AN ACACIA TREE MEETS THE URGENT NEED FOR EDUCATION IN AFRICA

was our nightly serenade at Loliondo, a serenade that kept up for much of the night, only to die with the lions' making a final close inspection of camp just at dawn.

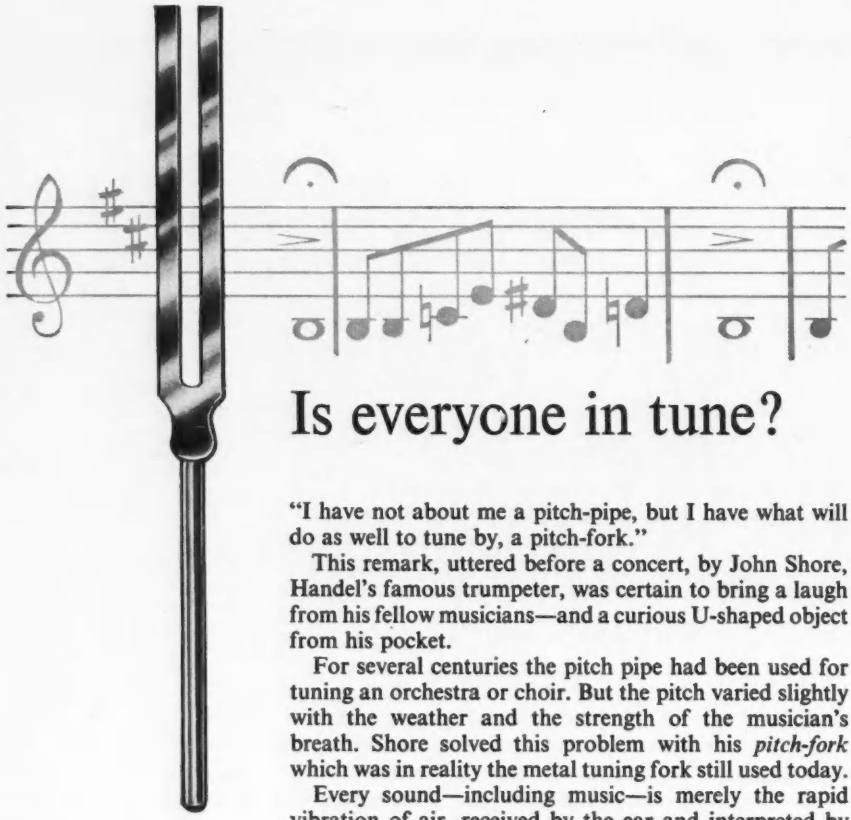
One night our native boys had quite an exciting experience. We learned of it in the morning. The boys had been drying meat and had a four-hundred-pound bale stored in one of their tents when two big male lions decided to retrieve it. These big cats walked in, took the four hundred pounds of meat, and proceeded to eat the whole thing within a few yards of camp. No one disturbed their banquet.

From here we proceeded south in Tanganyika to Dodoma, Nguru Mountains, Uluguru Mountains, and the Usambara Mountains, before turning north to Tanga, then into Mombasa and on to Nairobi.

Our expedition safari ended in Nairobi on October 15, 1960. After a most hectic few days of getting our equipment and specimens ready for shipment, we were on a jet on our way back. With the deepest regret at leaving and yet a knowing appreciation of the vastness of the northern frontiers of Kenya, we could almost feel the presence of the Lake Turkana tribesmen far below us as we passed over Ferguson's Gulf on Lake Rudolf.

Although a great deal was accomplished on this expedition, there remains much to be investigated in other areas. Africa, however, is in the throes of a social revolution. Conflicts like those in the Congo could occur any place, any time. Scientific research is over in the Congo for at least ten years.

The great Moroto Massive has yet to be explored, and there is still Lokitaung and the country west of the Tana, southern Tanganyika, and much more waiting to be investigated. There is so much to be done.



Is everyone in tune?

"I have not about me a pitch-pipe, but I have what will do as well to tune by, a pitch-fork."

This remark, uttered before a concert, by John Shore, Handel's famous trumpeter, was certain to bring a laugh from his fellow musicians—and a curious U-shaped object from his pocket.

For several centuries the pitch pipe had been used for tuning an orchestra or choir. But the pitch varied slightly with the weather and the strength of the musician's breath. Shore solved this problem with his *pitch-fork* which was in reality the metal tuning fork still used today.

Every sound—including music—is merely the rapid vibration of air, received by the ear and interpreted by the brain. Each musical note has its own rate of vibration. The A above middle C, for example, is tuned at 440 double vibrations per second. A strike on the metal tuning fork adjusted for A causes it to move at precisely that number of vibrations per second. By matching the sound produced by the vibrating fork with an A from his instrument, a musician can tell that the latter is in perfect pitch.

Just as the musician must have sensitivity to the sound of A, so must an official taster *in the Heinz quality control laboratories have a sensitivity to flavor; for no finished product can be released unless it is* in tune *with the master recipe.*

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ELEVATION BY FRITZ WINTER (Germany)
Oil, 53¼ x 57⅝ inches
Shown in the 1952 Pittsburgh International Exhibition of Contemporary Painting
Gallery of Contemporary Art, Carnegie Institute
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LETTER FROM GERMANY

GORDON BAILEY WASHBURN

AFTER the war, like the fabulous phoenix, Berlin showed great courage and vitality in rising again from her own ashes. Yet, today, as one travels about in Germany, where bombed cities are now ready to exhibit their powers of recuperation, Berlin seems to have suffered greatest hindrances to recovery. True, there is much to admire, including the beautiful Hansa center for which the leading architects of the world have designed apartment houses and churches. Yet one wanders for miles by car or by foot among shattered buildings and around empty cellar holes—even in West Berlin. Finally the wearisomeness of it all, the miserable housing, the acres of bomb-pocked plaster and broken concrete get the better of our spirits, and we long for fresh sights and new dwellings. This is probably why so many move out to other cities: to Munich, as have the Theodore Werners, where the old city is being restored to something of its former weighty somnolence; or to Stuttgart or Cologne, where glassy modern buildings cover almost all trace of these former cities and make them look for all

the world like Houston, Texas.

Other Berliners move into the suburbs where whole communities of new little houses begin to appear. Charlotte Weidler, Carnegie's correspondent in Germany, went with me to visit the artist Mauke, who had recently moved into such a doll's house. The Maukes were thrilled with their fresh little place, and Mrs. Mauke didn't object even when her husband began to mix fine coal ashes with his pigments, in spite of one room's—his studio—having to be sealed off from the rest of the house. They both work in a nearby factory to support themselves, and he must arise at four o'clock each morning to get to his paintings, again tackling them in the evening when he gets home. Mr. and Mrs. Leland Hazard, of Pittsburgh, who bought his painting out of the last PITTSBURGH INTERNATIONAL, will be as interested as I was to discover that Mauke has changed his style most radically. Introducing rags and other waste materials, he has begun to build the pictures out in low relief, the best of his new work being in monochrome. "Yet why not?" I asked myself as I recovered from my astonishment. Rapid changes in style and execution belong to our time, in which everything seems to shift and change in a constantly increasing tempo—including our ideas about the nature of reality. We need only review our own life experiences to believe those who claim that history never repeats itself. Indeed, we see that no two years in our lives seem to resemble each other in the faintest degree.

Only a quarter of a mile from Mauke's house is the frontier of Russian Germany, East Germany. We had driven along this border to reach Mauke's house, the invisible Iron Curtain rising to the right of us for several miles. Every once in a while we glimpsed the guardhouses raised on stilts just inside the fringe of woods by the roadside. I was told the guards will shoot any moving thing that may pass beyond the no man's land beside the road. It was not a reassuring thought, and I wondered how the Mauke family felt, not only to be living in such an island as Berlin but so helplessly exposed to "the cruel sea" just beyond.

When Charlotte Weidler and I had flown from Berlin to Frankfurt a few years ago, there was a great disturbance at the airport on our arrival because the Air France plane in front of us had been fired upon by the Russian ground forces. It had landed with holes in its wings. Nothing like that happened on this occasion, but I did feel happier to return to a place where it had proved easier for people to rebuild after the terrible destruction, and where their own faith in the future could therefore express itself freely. There is no special distinction about Frankfurt's rebuilding, as it is a bleakly commercial city, but for this very reason I was to discover one or two rather remarkable and certainly novel compensations that had appeared.

There are only a few art dealers' galleries of interest in Frankfurt, and there had therefore existed a dearth of opportunity for young artists and their eager patrons to find outlets of interest. Sometimes, when this situation occurs, an artist will encourage his colleagues to open a gallery for themselves. Such a gallery has recently been established in Berlin, the Galerie Diogenes, which promises to be a place of international interest as well as local value. As usual, its

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Mr. Washburn, director of the Department of Fine Arts at Carnegie Institute, has been in Europe this spring assembling contemporary painting and sculpture for the 1961 Pittsburgh International Exhibition (October 27 - January 7). His itinerary since leaving Germany includes Denmark, Belgium, Holland, England, and France. After vacation with Mrs. Washburn, he will return to Pittsburgh in July.

CALAMAR III, 1958 BY HANS PLATSCHEK (Germany)
Oil, 46 x 35 inches
Shown in the 1958 Pittsburgh International Exhibition of Contemporary Painting and Sculpture
Gallery of Contemporary Art, Carnegie Institute
Patrons Art Fund Purchase

excellence is due to adventuresome management, in this case to that of a sculptor-actor who keeps Diogenes going partly with his actor's earnings and partly by force of character.

But, in Frankfurt, another and even more unusual solution has been found. Since 1949, an insurance man named Klaus Franck has run a small gallery in a room and hallway of his apartment. Having a fine eye and little money, he opened it by offering young unknowns like Raoul Ubac, Sam Francis, as well as less known youngsters of a new generation, many of whom have since become figures of great fame. Now, since two years, a dentist named Dr. Horst Appel has likewise opened a little gallery, this time right in the waiting rooms of his office, and he too introduces the young people who may otherwise have no attention and no income on which to rely. I know of no other such art galleries in the world, since neither owner uses his for commercial gain, and both are contributing immensely to the art life of their community while at the same time satisfying their own love of art and their need to engage themselves actively in its interest. Mr. Franck also has movies, lectures, and concerts for which people pay what they can, dropping coins into a box at the door when they leave. Neither man is well-to-do, and they must therefore manage carefully to continue their projects without embarrassment.

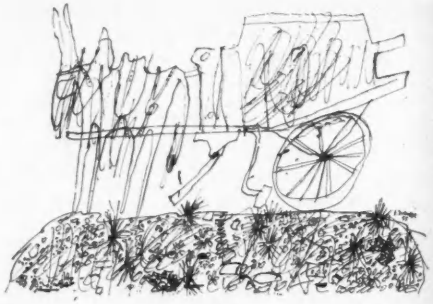
Going, as I do, from studio to studio—which for the most part is the same as going from artist's house to artist's house—it occurs to me to wonder whether *la vie Bohème* is at least temporarily in eclipse. Here in Europe—in Spain, Italy, Austria, Switzerland, and Germany where I have so far been—I have come across no sign of the old group life that invited socal rebellion and left us with the image of the artist as philanderer, civic rebel, or outlaw gypsy. Perhaps it still flourishes in unsung corners of Paris and New York, but even there I have not seen it in the exotic fancy dress of nineteenth-century romance, nor, indeed, in any dress

that distinguishes the artists' life from our own.

Here in Central Europe, young artists as well as old ones are to be seen in extremely sedate and simple circumstances, usually quietly surrounded by their devoted families. These, I think to myself, are the wild creatures who inexperienced people think are dedicating whole lifetimes to pulling our legs with joke-art and phony pictures. These are the sly monsters who, to deceive us, work in schools and shops and factories to have a little time to make spurious art. This young man who does hat-check work all night in a bar so that he can make sculpture during the day—I am thinking of the excellent young German sculptor Droste—is to have his integrity doubted the minute his art is exhibited.

German art, like that of all Western nations today, is moving still further in the direction of the *informel* that has been the constant trend since World War II. This means that the image is even more tenuous and indecisive than before; its effect one of thoughts and feelings that have drifted up from the deep to leave their traces on the canvas, like those that appear on the water's surface from movement of mysterious currents and disturbances in ocean depths far below. The universality of this imagery in art, appearing and developing simultaneously in every land, assures us what is taking place is no mere stylistic trend, born of an urge of fashion and the desire for novelty, but rather is the required expression of our day, a basic one.

Those of us who closely watch the shifting imagery of living art from year to year cannot fail to be impressed and moved by such a phenomenon as this. Usually such a movement is seen in retrospect after enough years have passed to isolate it from other waves of expression that have preceded



ANE ET CHARRETTE BY JEAN DUBUFFET (France)
Ink drawing, 12¾ x 19¼ inches
Carnegie Institute Collection
Gift of G. David Thompson

and followed it. But, just as we may also see the actual movement of the slowly turning hand on a clock, so too we may easily observe such trends as this if we are not diverted by a perverse wish to turn the clock back. What is moving about it is the realization it offers that, not by willful decision do we have our authentic developments in art expression (as with those who plaintively insist the next step must be a return to the figurative), but rather, we have them by instinct—or, if you will, by the grace of God. The future is not to be anticipated, not forced, not calculated.

Indeed, if we wish, we may learn this point of view from the artists themselves, since it has come to be understood as a *modus operandi* by nearly all of them in our time. Their art itself is not the product of anticipation, not a calculated image, nor is it created by any force of will. On the contrary, its imagery is regarded as given or discovered—the product of revelation rather than studied intention. It will be modified after birth by the intervention of the intellect, but its essential forms derive from the unconscious, which delivers them automatically and spontaneously. Today most works of art thus come into being over a

period of time, having been produced in several stages as the maker's inspiration for their imagery rises and falls. This is all clearly revealed in their forms, quite aside from attestations from the artists themselves. More than ever before, these forms tend to depart from architectonic and ornamental figurations, favoring the indecisive, the ambiguous, and the oracular. Obviously, they are not to be explained by either the observer or the maker, since they do not pretend to be—and are not—products of an exacting rationality. Those who wish to protest against such a creative approach, and there are many who do, can only discover they are protesting against the directions of the mainstream of creation as it now moves us along. This implacable river will not turn in its direction for our asking.

If we examine the products of this mode of creation, we see there are certain characteristics that differentiate such contemporary art from earlier material. Besides the differences we have already commented upon, we see at once there is a strong tendency toward the monochromatic—pictures all in one tint, whatever the variations in values. Though all in one "color," all black, all blue, or all white, there will usually appear in these works sufficient variations of both tone and texture (if produced only by the visible shifting of the direction of the stroke) to capture our interest and attention and to produce elusive but real forms within the total image.

A second characteristic is the tendency toward the all-over pattern. Here repetition plays a powerful role and often enough a hypnotic one. As with percussion music, or in compositions by Orff, Stockhausen, Varèse, and other moderns, we are drawn into a compulsive trance by a reiteration of the motives. The motives may be large, as in

CUT SLATE (1958) BY RAOUL UBAC (Belgium)
Slate, 26 x 27¼ inches
Shown in the 1958 Pittsburgh International Exhibition of Contemporary Painting and Sculpture
Gallery of Contemporary Art, Carnegie Institute
Patrons Art Fund Purchase

For your autumn calendar

Three lectures on the
1961 Pittsburgh International Exhibition
of Contemporary Painting and Sculpture

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Director of Fine Arts, Carnegie Institute
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Capogrossi's paintings, or small, as in Tobey's work; they may exactly repeat themselves as in Uecker's work, or offer rich and subtle modulations as in Dubuffet's great series in *Praise of the Earth*. But again and again our artists will give us pictures and sculptures that are without any central figuration, any single focus, favoring repeating forms that play over the surface in all directions until they reach the edge of the work.

The employment of foreign matter to the canvas—matter foreign to the conventions of Western art—hardly needs comment inasmuch as it has been practiced off and on for the last fifty years. However, current usage has extended mere *papier collé, collage,* or *montage* beyond the limitations of paper, textiles, and wood to the point where we are no longer surprised by what we find embedded in the matrix of the image. It may be new or old, fresh material or rubbish. Nor can we be sure, unless we ask the artist, whether such low reliefs are to be regarded as sculpture or painting, the fact of the matter being that the categories of the media have already been thoroughly broken down. Indeed, even titles have largely disappeared.

Besides building up the surface of paintings with thickened paint and by additions of such elements as silver foil, mirrors, stones, metal work, or what you will, our contemporary artists are often impelled to alter the surface still more drastically by piercing or breaking it so that one sees straight through the work to the wall behind. Here, too, the tendency toward the sculptural is evident since the relief effect is often strongly emphasized by such practices. Light may now play more richly with the surfaces, since real shadows as well as illusory ones will be produced. This usage may test the structural security of the work

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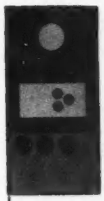
in no uncertain terms, as in the case of Fontana's pictures, where the surface tensions of the canvas are dangerously threatened by his elegant slashes with a knife.

It is not without interest to observe that the employment of such violence to the conventions, whether regarded from the mere technical or from the expressive point of view, comes at a time when artists exhibit no such violence in their private lives. As we have already noticed, their creative rebelliousness, to which they must be forever true, rarely extends in our day into the realm of their everyday living. Their roles as artists demand that, though they may preserve the great traditions of the creative life, they must attack and destroy any inclination toward using the conventions that lure all but the strongest into their easy embrace. But economic conditions are more favorable than they used to be, and, like the working classes who were once distinguishable by their underprivileged modes of life, most artists have also been absorbed into the classless uniformity of modern society.

I have spoken of the continuance and growth of the *informel* direction of art in Germany as elsewhere in Europe, but not yet of its opposite, which might be called *formel*. I do not refer merely to "hard-edged" painting, which is perhaps an intellectualist branch of it, so much as to the strong tendency within the youngest generation of European painters to veer away from personal expressiveness toward a mechanistic form of expression. This is seen in Germany in the art of Piene, Uecker, and Mack. These artists rely heavily on the repetition of the motive in works that aim to find a harmony with the technological forms of our mechanistic age. It is not a new approach, the machine having already been an inspiration since Duchamp, Picabia, Léger, and others played with its cold and impersonal forms and movements during the Cubist period and just afterwards. But its continuance and resurrection by a recent generation is noteworthy. There is about it a suggestion of revolt against the impurities of emotional torment and anguish, a revulsion from humanistic expressions of false idealism and all moralistic muddle-headedness of the kind that has led Europe into two vast disasters in half a century. May the Lord deliver us from human aspirations and private dreams! these young men seem to declare. Let us have something purely formal, something clean, pure, and cold that will no longer remind us of our profound disgust with man's sentimentality and his tiresome self-deceptions.



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BIOLOGICAL CONTROL OF PESTS

O. E. JENNINGS

AUSTRALIA has no native cacti, but a number have been introduced into that country. Several, particularly the prickly pear cacti, escaped and multiplied to such an extent that they rendered some 25,000,000 acres utterly unfit for use.

The situation improved only when parasites and predators on American cacti were introduced into Australia, notably a moth whose caterpillars bored into and ate out the insides of the plant. In seven years the pest was so well under control that the land was opened up for settlement, at cost, incidentally, of but a fraction of a penny per acre.

This was biological control: the use of plants or animals to directly or indirectly eradicate or control pests.

There are legions of pests and many, often widely different, methods of biological control. Pests vary, from the fly that annoys us, to the mosquito that transmits malaria, and the insects or plant diseases that destroy our crops or forests or domestic animals.

We now have various methods of combating these pests: we use quarantines; vary our methods of planting, tillage, and fertilization of crops; destroy infected materials or materials that harbor the pests; develop resistant or immune varieties of plants or breeds of animals; use more or less poisonous dusts or sprays; use X-ray or gamma-ray sterilization methods; use antibiotics; or use other plants or animals as parasites or predators.

Among the thousands of pests, plant diseases and insects are by far the most important. In the United States, insects alone annually destroy our crops to the value of more than a billion dollars. To ensure the abundance of food, clothing, and wood materials needed to maintain our high standard of living, we now use various of the 7,000 kinds of chemical pesticides at an annual cost of more than $400,000,000. It is predicted this amount will rise to one billion dollars by 1975.

At a recent international conference at the Walter Reed General Hospital in Washington, the fact that mounting resistance of various insects is contributing to health and medical problems was discussed. Since many of our insect pests have also been acquiring increased resistance to the customary insecticides, the chemical industry has been driven to the formulation of more toxic products, among which are the organic phosphate pesticides. These had their origin in German search for more powerful chemical-warfare agents during World War II. Many of the more recently formulated insecticides are too toxic to be suitable for general use around the home, hospital, or camp.

The question naturally arises: Is there not some way of avoiding the recurring huge annual expediture for more or less poisonous pesticides, not to mention the time and trouble of properly using them.

And the answer is—biological control, at least to some extent.

We can use cats to catch mice, a bacillus to control the Japanese beetle, insects to control the Klamath weed, antibiotics to kill the white pine blister rust, and so on; however, at the present time we must still rely for the most part on chemical pesticides.

Except for catastrophes such as hurricanes, fire, the destructive activities of mankind, and so on, the plants and animals of our primitive, natural, undisturbed deserts,

grasslands, forests, and waters usually maintain a fairly even balance—the "balance of nature"—as to numbers and kinds of individuals (except for population explosions, often rhythmic, as is the case with the lemming). However, if an insect, for instance, becomes unusually abundant, its parasites and predators thrive, become more abundant, and the balance is soon restored.

It is astonishing to find how many plants and animals are parasites or predators upon their fellow creatures. Among insects there are parasites upon parasites, which in turn are themselves parasites upon parasites, and these in turn parasitize other insects.

> Great fleas have little fleas upon their
> backs to bite 'em,
> And little fleas have lesser fleas, and
> so *ad infinitum*.
>
> —De Morgan

Our planet is rapidly becoming one world. In western Pennsylvania, for instance, we now have recorded 2,852 wild (uncultivated) flowering plants, of which at least 776—more than one fourth— have come to us from foreign lands. Many of the importations are not particularly pestiferous, probably being kept in check by our native parasites and predators, or perhaps not being able to adapt themselves to our conditions.

But some of the imported pests—plants or animals—such as the Japanese beetle, not being accompanied by the parasites and predators that kept them in balance at home, have increased inordinately and become rampant pests. The answer to this problem would seem to be to import the native enemies of these immigrant pests, but unfortunately their enemies are sometimes not able to exist in our country.

Effective biological control of pests in the United States began in 1872. The cottony-cushion scale insect appeared in California in that year and practically ruined

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the citrus industry. Albert Koeberle sent back from Australia 514 live vedalia beetles, better known as "lady bugs." These were reared and released. In less than two years the pest was under control, and, at cost of $5,000, the citrus industry of California was saved millions of dollars annually. The beetle is now equally effective in about fifty of the world's citrus-producing regions.

Control of the gypsy moth was not so easy. It is a devastating defoliator of trees. The gypsy moth escaped from an amateur entomologist in eastern Massachusetts in 1889. Someone has said, "He didn't know it was loaded." It has spread to New York, Pennsylvania, and New Jersey, where its farther progress has been checked by aerial DDT-spraying campaigns. Control has been hampered somewhat by litigation because the DDT spray did some damage to wildlife —particularly birds, fish, and honeybees— and because DDT residue appeared in milk from cows pasturing near sprayed trees. This rendered the sale of such milk illegal.

However, in the older part of the infested area more than forty of the parasites and predators that control the gypsy moth in its native Europe and Japan have been introduced. It is recently reported that nine of the parasites and two of its predators have become naturalized and are doing effective control work, with encouraging prospects for the future.

A European St.-John's-wort somehow reached the range lands of northern California, where by 1900 it took over the area, crowding out the more palatable forage plants. It is bitter, and animals eating it for lack of anything better develop body sores and swollen ears, becoming irritable and difficult to manage. It became known as the Klamath weed. In 1945 four kinds of insects that were controlling the pest in Australia were imported into Cali-

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fornia, reared in quantity, and released. The pest is now insignificant on the many thousands of acres of range lands. On a cost-benefit basis, chemical herbicides could not have been used.

Many microorganisms, such as fungi, bacteria, and viruses, are valuable biological control agents. They can be cultivated and produced at little cost; they can be used as a spray or dust; forms can be selected that are harmless to other plants, man, or other animals; and they can often be used to advantage in conjunction with chemical pesticides.

Thomas Austin released twenty-four European rabbits on his Australian estate in 1889 to improve the hunting. In six years they had increased to thirty thousand! In 1897 the Colony of New South Wales in the southeastern part of the country offered a reward of £25,000 for a method of exterminating the rabbits, which had ruined their range lands. The myxoma virus was introduced from South America in 1950, and, in six years over an area of 500,000 square miles, it was estimated that 400,000,000 rabbits had died of myxomatosis; the range lands were then restored to production.

As a control for a plant pest, the Canadian entomologists at Sault Sainte Marie found that a virus from Sweden was highly effective in controlling the European pine sawfly in their forests. The same virus has exterminated this insect from a pine plantation in Carbon County in northeastern Pennsylvania.

As to bacteria, the Japanese beetle appeared at a New Jersey nursery in 1916, and by six years spread over an area of 2,500 square miles. Quarantines, sprays, dusts, traps, hand-picking were generally not very effective. From Japan forty-nine of its native parasites and predators were imported, but none was very effective. However, in 1933,

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some unusually light-colored, diseased, beetle grubs were discovered in New Jersey. Their "blood" was milky, hence the disease was named the Milky Disease. It was found to be caused by a bacterial bacillus.

Now the grubs are reared in an insectary, infected with the bacillus, killed, dried, ground up and prepared as a powder to be sprinkled over the lawn. This kills the Japanese beetle grubs and spreads to adjacent lawns. Now the powder may be obtained in seed stores.

A mere mention of other important biological control methods may be sufficient to indicate the importance of this rapidly developing phase of pest control.

There are pestiferous microscopic eelworms, or nematodes. One of these, the potato eelworm, caused an annual loss of £2,000,000 to the British potato crop. However, the potato eelworm is frequently trapped, penetrated, and its insides absorbed by microscopic soil molds. The numbers of these soil molds can be increased by using decayed compost or barnyard fertilizers. With the destruction of the eelworms, the potato crop increases.

The antibiotic, streptomycin, controls many plant diseases, notably the fire blight of apple and pear trees. It has been recently found that a closely related antibiotic, cyclohexamide (known commercially as Actidione), when sprayed on the bark at the base of the western white pine, is absorbed. It is carried up in the sap stream and kills the cankers of the white pine blister rust. This discovery is very important. It very likely can be applied to our eastern white pine, probably the peer of our eastern native trees for both ornamental value and production of lumber.

The screwworm fly of Florida lays its eggs in wounds and around the navels of newborn livestock, often with fatal results. By rearing large numbers of these flies, sterilizing them with gamma rays, and releasing them among the nonsterilized flies, a large proportion of sterile eggs can be produced. This has exterminated the fly in less than two years, and saved the Florida livestock industry some $10,000,000 annually.

Applied plant-breeding research in the United States up to 1957 produced 82 new varieties of crop plants resistant to pests. In 1952 it was estimated that such resistant varieties had increased the annual crop yield to the value of $691,000,000; for example, after appearance of the resistant wheat variety known as Pawnee, the Hessian fly, a pest destructive of wheat, became relatively of little consequence.

It must not be assumed that biological control can take the place of chemical control where fast action is needed with quickly maturing crops, such as berries. There is great need, however, for a specific chemical insecticide that is toxic only to the pest and not to other organisms including man.

Dr. L. P. Reitz, of the United States Department of Agriculture, recently wrote:

"Although less dramatic, perhaps, than chemical control, biological control is the ideal way to control pests—no residue problems, no maintenance expense, no further attention by growers. Realization of the ideal is a long way off for many plant problems; it has scarcely started in the animal field."

Dr. Jennings is director emeritus of Carnegie Museum and professor emeritus of biological science of the University of Pittsburgh. His article is based upon a paper he delivered last January to the Polygon Club at the University.

ART AND NATURE SHOP

Odd and interesting objects

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